Small Business Innovation Research/Small Business Tech Transfer

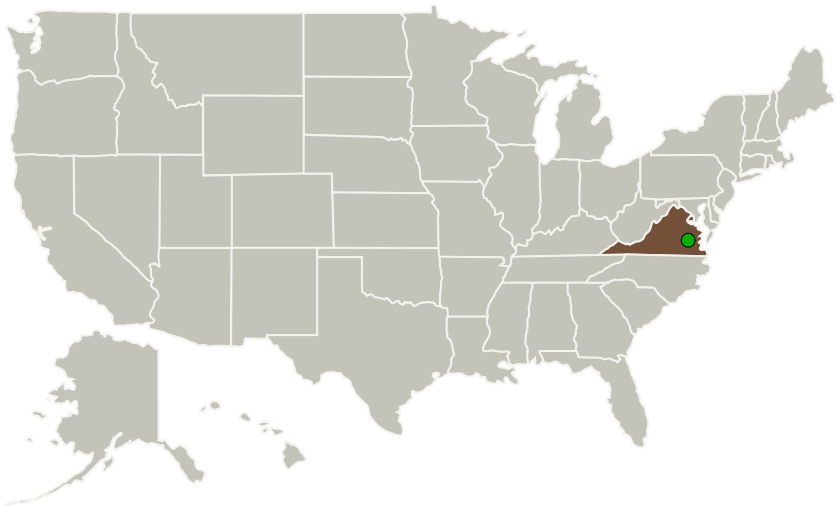
3D Flow Field Measurements using Aerosol Correlation Velocimetry, Phase I

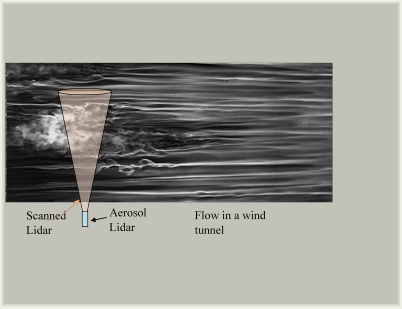
Completed Technology Project (2015 - 2015)

Project Introduction

AeroMancer Technology proposes to develop a 3D Lidar Global Airspeed Sensor (3D-GLAS) for remote optical sensing of three-component airspeeds in wind tunnel applications. Current methods of non-intrusive airspeed measurement include techniques such as Laser Doppler Velocimetry (LDV), Particle Imaging Velocimetry (PIV) and Doppler Global Velocimetry (DGV). However, some common drawbacks of all these standoff methods for 3D airspeed sensing are that they require precise alignment of separate transmitters and receivers; and it is expensive and unwieldy to extend these measurements to a large enough volume to be practical for use in medium and large wind tunnels. The proposed instrument uses range-resolved elastic backscatter data from a lidar beam that is scanned over the volume of interest to generate a 3D map of aerosol density in a short time span. Aerosol density fluctuations are cross-correlated between successive scans to obtain the displacements of the aerosol features along the three axes. Thereby, temporally and spatially resolved velocity measurements are possible at high resolution. In Phase 1, AeroMancer proposes to conduct a requirements analysis to identify the functional and operational needs of wind tunnel application and of the instrument. A signal link budget analysis tool of the proposed lidar will be developed to aid in instrument design and scaling. A conceptual design of the instrument will be developed, where the system architecture and main components will be identified. The preliminary design of the software for extraction of 3D airspeed information from the lidar data will be developed. The design studies will be supported using experimental tests with a previously developed lower-fidelity prototype of a different configuration.

Primary U.S. Work Locations and Key Partners





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Completed Technology Project (2015 - 2015)

Organizations Performing Work	Role	Type	Location
AeroMancer Technologies Corporation	Lead Organization	Industry Small Disadvantaged Business (SDB)	Washington, District of Columbia
Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

Primary U.S. Work Locations	
District of Columbia	Virginia

Project Transitions

June 2015: Project Start

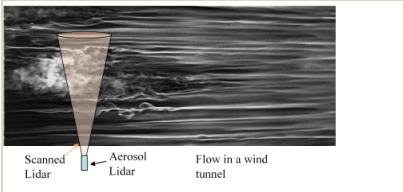
December 2015: Closed out

Closeout Summary: 3D Flow Field Measurements using Aerosol Correlation Velocimetry, Phase I Project Image

Closeout Documentation:

- Final Summary Chart Image*(https://techport.nasa.gov/file/138603)*

Images



Briefing Chart Image
3D Flow Field Measurements using Aerosol Correlation Velocimetry, Phase I
(https://techport.nasa.gov/image/127653)

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
AeroMancer Technologies Corporation

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Anand R Mylapore

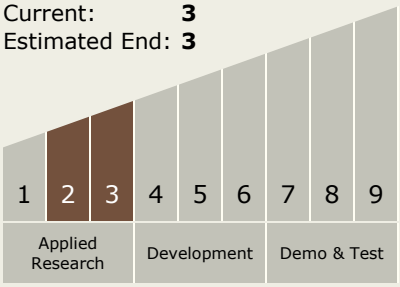
Co-Investigator:
Anand Radhakrishnan

3D Flow Field Measurements using Aerosol Correlation Velocimetry, Phase I

Completed Technology Project (2015 - 2015)

Technology Maturity (TRL)

Start: **2**
Current: **3**
Estimated End: **3**



Technology Areas

Primary:

- TX15 Flight Vehicle Systems
  - TX15.1 Aerosciences
    - TX15.1.8 Ground and Flight Test Technologies

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System